A WG CLAIM'
~~New Patent Claims~~

(replace the original Patent Claims 1 to 71 on th original pages 44-58)

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1. Optical-fibre transmission system comprising a cable closure for optical waveguides with splice organizers and excess-length depositories for excess lengths of optical waveguide and comprising at least one optical-fibre cable, cable lead-in units in the form of cable lead-in spigots being arranged into the cable closure perpendicularly with respect to the axis of the closure body of the cable closure, the excess lengths of optical waveguide and the splice organizers being arranged within the closure body removably in the axial direction of the closure body, and at least one end face of the closure body being closed off in a sealing manner by an externally accessible cover, characterized in that the cable lead-in units are designed as lead-in spigots (13) in the form of pipes (45, 46) tightly fitted on, in that the optical-fibre cables (10) in the form of optical waveguide minicables or optical waveguide microcables, respectively comprising a pipe (8, 9, 15) and optical waveguides (12), optical waveguide strips or optical waveguide bundles loosely introduced therein, are arranged in the cable lead-in units (13, 17 - 18, 45, 46, 56, 70) designed in terms of pipe connecting technology for receiving and sealing off the pipes (8, 9, 15) of the optical-fibre cables (10), the sealing connection of the pipe connecting technology being a welded, soldered or adhesively bonded connection between the pipe (8, 9, 15) of the optical-fibre cable (10) and the cable lead-in unit (13).

2. Optical-fibr transmission system comprising a cabl closure for optical waveguid s with splic organizers and excess-length depositories for excess lengths of optical waveguide and comprising at least one optical-fibre cable, cable lead-in units in the form of cable lead-in spigots being arranged into the cable closure perpendicularly with respect to the axis of the closure body of the cable closure, the excess lengths of optical waveguide and the splice organizers being arranged within the closure body removably in the axial direction of the closure body, and at least one end face of the closure body being closed off in a sealing manner by an externally accessible cover, characterized in that the cable lead-in units are designed as lead-in spigots (13) in the form of pipes (45, 46) tightly fitted on, in that the optical-fibre cables (10) in the form of optical waveguide minicables or optical waveguide microcables, respectively comprising a pipe (8, 9, 15) and optical waveguides (12), optical waveguide strips or optical waveguide bundles loosely introduced therein, are arranged in the cable lead-in units (13, 17 - 18, 45, 46, 56, 70) designed in terms of pipe connecting technology for receiving and sealing off the pipes (8, 9, 15) of the optical-fibre cables (10), the sealing connection of the pipe connecting technology being a press connection with sealing means and a pressing element with a union nut, between the pipe (8, 9, 15) of the optical-fibre cable (10) and the cable lead-in unit (13).

3. Optical-fibre transmission system comprising a cable closure for optical waveguides with splice organizers and excess-length depositories for excess lengths of optical waveguide and comprising at least one optical-fibre cable, cable lead-in units in the form of cable lead-in spigots being arranged into the cable closure perpendicularly with respect to th axis of the closure body of th cabl closure, the xcess lengths of

optical wav guide and th splice organizers being arranged within th closure body removably in the axial direction of the closure body, and

at least on end fac of the closure body being clos d off in a sealing manner by an externally accessible cover, characterized in that the cable lead-in units are designed as lead-in spigots (13) in the form of pipes (45, 46) tightly fitted on, in that the optical-fibre cables (10) in the form of optical waveguide minicables or optical waveguide microcables, respectively comprising a pipe (8, 9, 15) and optical waveguides (12), optical waveguide strips or optical waveguide bundles loosely introduced therein, are arranged in the cable lead-in units (13, 17 - 18, 45, 46, 56, 70) designed in terms of pipe connecting technology for receiving and sealing off the pipes (8, 9, 15) of the optical-fibre cables (10), the sealing connection of the pipe connecting technology being a plastic crimped connection (58, 89) or a permanently elastic, annular seal between the pipe (8, 9, 15) of the optical-fibre cable (10) and the cable lead-in unit (13).

4. Optical-fibre transmission system according to Claim 72 wherein ~~characterized in that~~ the closure body ~~(5, 44)~~ has a cylindrical shape.

5. Optical-fibre transmission system according to Claim 72 wherein ~~characterized in that~~ the closure body has an oval shape.

6. Optical-fibre transmission system according to ~~one of Claims 1 to 5, characterized in that~~ claim 1, wherein the lead-in spigots ~~(13)~~ are led in tangentially at the wall of the closure of the closure body ~~(5, 44)~~.

7. Optical-fibre transmission system according to ~~one of Claims 1 to 5, characterized in that~~ claim 1, wherein

the lead-in spigots (13) are led in radially at the wall of the closure of the closure body (5, 44).

8. 72 Optical-fibre transmission system according to claim 1, wherein the ~~one of the preceding claims, characterized in that the~~ cable lead-in units (13) for the inlet direction and outlet direction lie on the same level.

9. 72 Optical-fibre transmission system according to claim 1, wherein the cable ~~one of claims 1 to 8, characterized in that the cable~~ lead-in units (13) for the inlet direction and outlet direction lie at different levels.

10. 72 Optical-fibre transmission system according to claim 1, wherein the ~~one of the preceding claims, characterized in that the~~ cable lead-in units ~~(13)~~ point in the same direction.

11. 72 Optical-fibre transmission system according to claim 1, wherein the cable ~~one of claims 1 to 9, characterized in that the cable~~ lead-in units ~~(13)~~ point in different directions.

12. 72 Optical-fibre transmission system according to claim 1, wherein the ~~one of the preceding claims, characterized in that the~~ excess lengths of optical waveguide (24) are arranged circular up against the inner wall of the closure body (5).

13. 72 Optical-fibre transmission system according to claim 1, wherein ~~one of the preceding claims, characterized in that~~

the excess lengths of optical waveguide ~~(30, 38)~~ are arranged in groups at different levels in the closure body ~~(5)~~.

14. ~~Optical-fibre transmission system according to one of the preceding claims, characterized in that the~~ Claim 12 wherein the excess lengths are protected by a flexible buckle-resistant tube ~~(54)~~, which is deposited in a plurality of loops, maintaining the minimum bending radius, in the inner closure body.

15. Optical-fibre transmission system according to Claim 3, ~~characterized in that~~ wherein a plastically deformable soft-metal tube ~~(87)~~ is used for the crimped connection between the microcable and the cable lead-in unit ~~(13)~~.

16. Optical-fibre transmission system according to one of the preceding claims, characterized in that a compensation loop (47) of the pipe of the optical-fibre cable (10) is arranged ahead of the lead-in into a cable lead-in unit (13).

17. Optical-fibre transmission system according to Claim 16, ~~characterized in that~~ wherein the compensation loop ~~(47)~~ is arranged as an attachment to the cable lead-in unit ~~(13)~~.

18. Optical-fibre transmission system according to one of the preceding claims, characterized in that the closure housing (5, 44) and the cover (20, 73, 74) are designed to withstand high mechanical loading for fitting into a drilled core hole of a laying route in the ground, preferably in a road surfacing.

19. Optical-fibr transmission system according to claim 1, wherein the ~~one of the preceding claims, characterized in that the~~ cable lead-in units ~~(13)~~ for triple branches are fitted in a T-shape on the closure housing ~~(5, 44)~~.

20. Optical-fibre transmission system according to claim 1, wherein the ~~one of claims 1 to 18, characterized in that~~ cable lead-in units ~~(13)~~ for quadruple branches are fitted in a cross shape on the closure housing ~~(5, 44)~~.

21. Optical-fibre transmission system according to claim 1, wherein ~~one of the previously specified claims, characterized in that~~ the lead-in openings of the cable lead-in units ~~(13)~~ are designed in a funnel shape and ~~preferably~~ have a length stop for the microcable ~~(10)~~.

22. Optical-fibre transmission system according to claim 1, wherein the ~~one of the preceding claims, characterized in that the~~ cable closure ~~(61)~~ is arranged in a protective housing ~~(64)~~, the protective housing ~~(64)~~ having lead-through openings ~~(63)~~ for the optical-fibre cables ~~(62)~~ and ~~in that the~~ intermediate space between the cable closure ~~(61)~~ and the inner wall of the protective housing ~~(64)~~ is filled, ~~preferably~~ with a flexible foam filling ~~(66)~~ of plastic.

23. Optical-fibre transmission system according to Claim 22, wherein ~~characterized in that~~ the protective housing ~~(64)~~ consists of concrete and has a removable, load-bearing cover ~~(68)~~.

24. Optical-fibre transmission system according to claim 1, wherein the ~~one of the preceding claims, characterized in that~~

th diamet r of the cable closur is 70 to 100 mm and the height is 150 to 250 mm.

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25. Optical-fibre transmission system comprising a cable closure for optical waveguides with splice organizers and excess-length depositories for excess lengths of optical waveguide and comprising at least one optical-fibre cable, cable lead-in units of the cable closure being arranged in the axial direction of the closure body of the cable closure, characterized in that the cable closure (1, 2, 1a, 1b) comprises an extended closure pipe (19), in that the closure pipe (19) is adapted at the ends to the diameter of the pipe of the optical-fibre cable (8, 9, 10, 15), in that the leading in of the pipes of the optical-fibre cables takes place in the axial direction of the closure pipe (19) and in that the seals between the closure pipe (19) and the optical-fibre cables (8, 9, 10, 15) take place in cable lead-in units (17 - 18) adapted in terms of pipe connecting technology to the diameters of the optical-fibre cables, the sealing connection of the cable lead-in unit (17 - 18) in terms of pipe connecting technology comprising peripheral press seals.

26. Optical-fibre transmission system comprising a cable closure for optical waveguides with splice organizers and excess-length depositories for excess lengths of optical waveguide and comprising at least one optical-fibre cable, cable lead-in units of the cable closure being arranged in the axial direction of the closure body of the cable closure, characterized in that the cable closure (1, 2, 1a, 1b) comprises an extended closure pipe (19), in that the closure pipe (19) is adapted at the ends to the diameter of the pipe of the optical-fibre cable (8, 9, 10, 15), in that the leading in of the pipes of the optical-fibre cables takes place in th axial dir ction of th closure pipe (19) and in that the

seals between the closure pipe (19) and the optical-fibre cables (8, 9, 10, 15) take place in cable lead-in units (17 - 18) adapted in terms of pipe connecting technology to the diameters of the optical-fibre cables, and the ends of the extended closure pipe (19) are provided in terms of pipe connecting technology with an external thread, in that the seals are formed by union nuts (17 - 18) and elastic sealing inserts (14).

27. Optical-fibre transmission system comprising a cable closure for optical waveguides with splice organizers and excess-length depositories for excess lengths of optical waveguide and comprising at least one optical-fibre cable, cable lead-in units of the cable closure being arranged in the axial direction of the closure body of the cable closure, characterized in that the cable closure (1, 2, 1a) 1b) comprises an extended closure pipe (19), in that the closure pipe (19) is adapted at the ends to the diameter of the pipe of the optical-fibre cable (8, 9, 10, 15), in that the leading in of the pipes of the optical-fibre cables takes place in the axial direction of the closure pipe (19) and in that the seals between the closure pipe (19) and the optical-fibre cables (8, 9, 10, 15) take place in cable lead-in units (17 - 18) adapted in terms of pipe connecting technology to the diameters of the optical-fibre cables, and in that the seals at the ends of the extended closure pipe (19, KM) are formed in terms of pipe connecting technology by crimped connections (87).

28. Optical-fibre transmission system according to claim 25, wherein ~~one of claims 25 to 27, characterized in that~~ the ends of the extended closure pipe of the cable closure ~~(2)~~ have different diameters for adaptation to different diameters of pipes of various optical-fibre cables ~~(9, 15)~~.

29. ~~72~~ Optical-fibr transmission system according to claim 1, wherein the cable ~~one of claims 25 to 27, characterized in that the cable~~ closure comprises a plurality of rings ~~(33, 35)~~ which can be placed closely against one another.

30. ~~72~~ Optical-fibre transmission system according to claim 1, wherein ~~one of claims 25 to 37, characterized in that~~ the closure body ~~(33 - 35), or the extended closure pipe (19),~~ is longitudinally divided, ~~preferably~~ in the plane of the cable lead-in units ~~(13, 36)~~.

31. Optical-fibre transmission system according to Claim ~~2 or 25, characterized in that~~ 25, wherein cutting rings are arranged in the cable lead-in units ~~(13)~~.

32. Optical-fibre transmission system according to Claim 29, wherein ~~characterized in that~~ sealing systems are incorporated in the separating planes between the individual rings ~~(33, 35)~~.

33. Optical-fibre transmission system according to Claim 29, wherein the ~~characterized in that~~ cable lead-in units ~~(13)~~ are arranged in the separating planes between the individual rings ~~(33, 35)~~ or sections.

34. ~~72~~ Optical-fibre transmission system according to claim 1, wherein the ~~one of the preceding claims, characterized in that the~~ interior space of the cable closure ~~(5)~~ is subdivided by separating plates ~~(29)~~ into a plurality of sections.

35. Optical-fibr transmission system according to ~~one of Claims 1 to~~ claim 3, wherein ~~characterized in that~~ th cable closure has two covers ~~(68, 73, 76, 80),~~ arranged one above the other, the inner cover for (73) sealing and the outer cover for (68, 76, 80) absorbing mechanical loads.

36. Optical-fibre transmission system according to ~~one of Claims~~ claim 3 or 27, wherein ~~characterized in that~~ the crimped connection protects the tubular microcable (1) at the cable lead-in of the cable closure against tensile, compressive and torsional stress.

37. Optical-fibre transmission system according to ~~one of Claims~~ claim 16 or 17, wherein ~~characterized in that~~ differences in the elongation of the microcable (10) with respect to the surrounding bitumen can be compensated by the compensation loop ~~loops (47)~~.

38. Optical-fibre transmission system according to ~~one of Claims 3, 27, 36 or 37, characterized in that the~~ claim 3, wherein complete cable closure, comprising closure body, cover, splice organizer, protective tube, cable lead-in units, sealing systems, crimped connections and compensation loops, is prefabricated at the factory.

39. Optical-fibre transmission system according to ~~one of Claims 2 or 26, characterized in that cold- or hot-shrink~~ claim 2, wherein shrink tubes, O-rings, annular lip seals or permanently elastic seals may be used for an elastic sealing.

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40. Optical-fibre transmission system according to Claim 27, characterized in that sealing heads (DK1-DK4) of plastically deformable material, preferably of a metal, are crimped onto the pipes of the optical-fibre cables (MK1-MK6) in a sealing manner at peripheral crimping points (KRK), in that the closure pipe (MR1, MR2) likewise consists of deformable material, preferably of a metal, and is crimped on at its end faces onto the sealing heads (DK1-DK4) at the peripheral crimping points (KRMR), in that the closure pipe (MR1, MR2) is dimensioned in length such that adequate excess lengths of optical waveguide (LU1, LU2) can be arranged in waveform extent and optical-fibre splices (LS) can be arranged.

41. Optical-fibre transmission system according to Claim ~~27 or~~ 40, wherein ~~characterized in that~~ the optical-fibre splices ~~(LS)~~ are arranged in series one behind the other within the cable closure ~~(KM)~~.

42. Optical-fibre transmission system according to Claim 40, wherein ~~characterized in that~~ the optical-fibre splices ~~(LS)~~ are arranged next to one another within the cable closure ~~(KM)~~.

43. Optical-fibre transmission system according to ~~one of Claims~~ claim 40 ~~to 42, characterized in that the~~ wherein a bore ~~(BDK)~~ in ~~the~~ each sealing head ~~(DK1, DK2)~~ is adapted in each case to the diameter of the pipe of the optical-fibre cable ~~(MK1-MK6)~~ and in that a peripheral stop ~~(AS)~~ for the pipe of the corresponding optical-fibre cable ~~(MK1-MK6)~~ is arranged within the bore ~~(BDK)~~.

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44. Optical-fibre transmission system according to one of Claims 40 to 42, characterized in that

the sealing head (DK3, DK4) has a plurality of lead-in bores (EB), in that crimpable cable lead-in spigots (KES1-KES4) are inserted in a sealtight manner in the lead-in bores (EB), the seals between the pipes of the optical-fibre cables (MK1-MK6) and the cable lead-in spigots (KE1-KE4) taking place at the peripheral crimping points (KRK).

45. Optical-fibre transmission system according to one of Claims 40 to 44, characterized in that the sealing heads (DK1-DK4) and/or the closure pipe (MR1, MR2) consist of copper or similarly plastically deformable metal or copper-based wrought alloys.

46. Optical-fibre transmission system according to one of Claims 40 to 44, characterized in that the sealing heads (DK1 to DK4) and/or the closure pipe (MR1, MR2) consist of aluminium or cold-workable, non-hardenable aluminium alloys.

47. Optical-fibre transmission system according to one of Claims 40 to 44, characterized in that the sealing heads (DK1 to DK4) and/or the closure pipe (MR1, MR2) consist of plastically deformable, non-hardened, stainless steel.

48. Production of a sealtight splice connection with the aid of a cable closure for an optical-fibre transmission system according to one of Claims 40 to 47, characterized in that the closure pipe (MR1, MR2) is pushed over one end of the pipe of the one optical-fibre cable (MK1), in that this end of the optical-fibre cable (MK1) is fixed in a fixing (FMK1) and in that the one sealing head (DK1) is pushed onto and crimped onto this end of the optical-fibre cable (MK1),

in that at a distanc , which corresponds to th closure pipe (MR1), the second s aling h ad (DK2) is crimped onto the likewise fixed end of the pipe of the second optical-fibre cable (MK2), in that subsequently the required splicing work is carried out, in particular with the aid of a splicer (SPG), excess lengths of optical waveguide (LU1, LU2) being provided on both sides of the splices (SS), in that then the closure pipe (MR1), extending over and beyond the excess lengths of optical waveguide (LU1, LU2) and the splices (SS), is crimped on in a sealtight manner on the two positioned sealing heads (DK1, DK2).

49. Optical-fibre transmission system according to claim 40, wherein the ~~one of claims 40 to 47, characterized in that the~~ electrically conductive pipes of the microcables ~~(MK1)~~ are through-connected electrically conductively to one another by the closure pipe ~~(MR1)~~ and the crimped-on sealing heads ~~(DK1)~~.

50. Optical-fibre transmission system according to one of Claims 2 or 26, characterized in that the sealing heads have threads at their ends, in that deformable cutting rings are inserted at the sealing points between the sealing head outer facings and the closure pipe and between the sealing head bores and the pipe ends of the microcables, in that union nuts over the cutting rings are screwed onto the threads of the sealing heads.

51. Method of connecting a microcable comprising a pipe with led-in optical waveguides, which is introduced into a laying channel in firm laying ground, to an existing optical-fibre transmission system of a conventional type with cable closures from the optical-fibre transmission system according to one of the preceding claims, characterized in that

the microcable (105) is led into an adapter closure (110), for r ceiving microcables, through a cabl lead-in (107) of a manhole (103) of the existing optical-fibre transmission system (104) which has been made in the same laying ground, in that optical waveguides of a flexible cross-connecting cable (111) are spliced onto the optical waveguides of the microcable (105) within the adapter closure (110) and in that the cross-connecting cable (111) is led into a conventional splicing closure (113) for optical waveguides for connection to the optical cables of the existing optical-fibre transmission system (104), the joining together being performed within the splicing closure (113).

52. Method according to Claim ~~51~~ 70, characterized in that the microcable ~~(105)~~ led into the manhole ~~(103)~~ is mechanically protected by a protective pipe ~~(109)~~ up to the adapter closure ~~(110)~~.

53. Method according to ~~one of Claims 51 or~~ claim 52, ~~characterized in that~~ which includes forming a core hole ~~(108) is made~~ into the laying ground ~~(102)~~ on the outer side of the wall of the manhole ~~(103)~~ in the intended leading-in region, ~~in that~~ and the lead-in of the microcable ~~(105)~~ is led via the core hole ~~(108)~~ and beyond into the manhole ~~(103)~~ in a seal-tight manner by seals ~~(107)~~.

54. Method according to one of Claims ~~51 to 53~~ 70, ~~characterized in that~~ wherein microcables at different laying heights are led into a manhole ~~(103)~~.

55. Method of connecting an optical-fibre transmission system comprising a cable closure and at least one microcable comprising a pipe with led-in optical waveguides, which has been introduced into a main channel in solid laying ground,

according to on of the preceding claims, to an xisting optical-fibre transmission system of a conventional type, characterized in that the microcable (117) is led at the end of the solid laying ground (102) into an adapter closure (120) at the height of the laying channel and is spliced onto a buried cable (124), in that the buried cable (124) is laid in the earth (123) at the height of the leading-in level of the manhole (103) made in the earth (123), is led into the manhole (103) and is spliced there within a splicing closure (113) onto the existing optical-fibre network.

Sub A16 56. Optical-fibre transmission system according to one of Claims 16, 17 or 37, characterized in that a protective device for elongation loops of optical-fibre cables, in particular of microcables, for terminating a core hole in solid laying ground is arranged, in that the protective device comprises a protective cover (SD) and a driving-in peg (ES), provided centrally at one end, for fixing in a central hole at the bottom of the core hole (KB), in that the diameter of the protective cover (SD) corresponds to the diameter of the core hole (KB) and in that filling material is arranged above the protective cover (SD) for sealtight termination and for filling the remaining core hole (KB).

57. Optical-fibre transmission system according to Claim 56, ~~characterized in that~~ wherein laying channels ~~(VN1, VN2)~~ run into and out of the core hole ~~(KB)~~ tangentially.

58. Optical-fibre transmission system according to ~~one of Claims~~ claim 56 ~~or 57, characterized in that~~ wherein the protective cover ~~(SD)~~ has on its upwardly facing side a pulling eyelet ~~(ZO)~~.

59. Optical-fibre transmission system according to ~~one of Claims 56 to 58, characterized in that~~ claim wherein the driving-in peg (ES) has in the free space of the core hole (KB), as a diameter limitation (EBS) for the elongation loop (DS) with a diameter which corresponds to the minimum permissible bending radius of the led-in cable (MK).

60. Optical-fibre transmission system according to ~~one of Claims 56 to 59, characterized in that the filling~~ claim 56, wherein the filling material (FM) consists of bitumen.

61. Optical-fibre transmission system according to Claim 60, ~~characterized in that~~ wherein crushed solid materials, for example chippings, are added to the filling material ~~(FM)~~.

62. Optical-fibre transmission system according to ~~one of Claims~~ claim 56 ~~to 61, characterized in that~~ wherein the free space of the core hole (KB) underneath the protective cover (SD) is filled with a filler, which does not hinder the free movement of the microcable (MK).

63. Optical-fibre transmission system according to one of Claims 1 to 24, characterized in that the cable closure (KMO) comprises an outer body (AK) which can withstand high mechanical loads and a cable-closure sealing body (KDK) fitted in the outer body (AK), in that the outer body (AK) has a removable outer cover (AD), which lies at the same height as the surface (SO) of the laying ground (VG), in that the cable-closure sealing body (KDK) lying thereunder is closed off by an upwardly removable sealing cover (DD), in that cable connection units (KA1, KA2, KA3) in pipe form

are led in from below through the outer body (AK) into the cable-closure sealing body (KDK) and in that the ends of the cables (K, MK) are led into these cable connection units (KA1, KA2, KA3) and sealed off.

64. Optical-fibre transmission system according to Claim 63, ~~characterized in that~~ wherein the ends of the cables in the form of microcables (MK), ~~respectively comprising~~ which comprise a pipe and optical waveguides guided therein, are connected in a sealtight manner to the cable connection units (~~KA~~) by crimped connections (~~KV~~).

65. Optical-fibre transmission system according to ~~one of~~ Claim 63, ~~characterized in that~~ wherein a shrink tube piece (~~SS~~) is arranged at the end of a cable connection unit (~~KA3~~) for the sealtight leading in of a cable (~~K~~).

66. Optical-fibre transmission system according to ~~one of Claims 63 to 65, characterized in that the~~ Claim 63, wherein the leading-in points of the cable connection units, ~~(KA1, KA2, KA3)~~ are bent off in a horizontal direction at the laying height of the cables (~~K, MK~~) introduced in the laying ground (~~VG~~).

67. Optical-fibre transmission system according to ~~one of Claims~~ Claim 63, ~~to 65, characterized in that~~ wherein the cable closure (~~KMQ~~) has additional cable connection units on the side wall, which are fitted on at the height of laying channels for microcables.

68. Optical-fibre transmission system according to ~~one of Claims 63 to 65, characterized in that~~ claim 63, wherein

the int rm diat spac b tw en th cabl -closur sealing body ~~(KDK)~~ and the outer body ~~(AK)~~ is filled with a filler ~~(FS), preferably an expandable plastics foam~~.

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Add A15?
add B1?
add C1?
Add I?
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